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A DIVISION OF
FLIGHTEX FABRICS INC.
~~CAMBRIDGE, MASS.~~
EVERETT, MASS.

PRODUCT PROCESS Engineering

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REPORT NO. 9-60-50G-111

MONTHLY PROGRESS REPORT

ENGINEERING PROGRAM FOR

THE PILOT PRODUCTION OF A

LIGHTWEIGHT ANTITANK WEAPON

FOR THE PERIOD

MONTH OF SEPTEMBER 1960

CONTRACT NO. RD-142

ORDNANCE PROJECT NO.

DEPT. OF ARMY PROJECT NO.

14

HESSE - EASTERN DIVISION

FLIGHTEX FABRICS, INC.

PROGRESS REPORT #5

ENGINEERING PROGRAM FOR THE PILOT PRODUCTION OF

A LIGHTWEIGHT ANTITANK ROCKET

SEPTEMBER 1960

CONTRACT NO. RD-142

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EVERETT, MASSACHUSETTS

WORK ACCOMPLISHED DURING THE MONTH OF SEPTEMBER 1960

SYSTEM EVALUATION PROGRAM

After completing the evaluation of the problem posed by the failure of a motor barrier, the first small quantity of weapons using the final components, as revised in the area of the fuze, barrier, and launcher, was assembled and tested at hot and cold temperatures. The test showed the system to function 100%. Final arrangements to start on the pilot production are now in progress.

The static train functioning tests were finally started and eighteen rounds fired. It was found that a problem of an occasional low order detonator exists. This was borne out by the fact that a low order detonator was found to be among the rounds fired in the system check-out test discussed above.

The loading of the HEAT heads is proceeding after some initial difficulties have been overcome. These consisted mainly in the fact that the funnels which were used to cast the small quantity of heads which were cast at the J-2 Range during the R&D program were found not to be suitable for a larger scale operation. New funnels have been made and appear to give satisfactory results. The first lot of heads will be x-rayed in October.

The delay and additional cost to the program,which was incurred due to unforeseen problems in the areas of the fuze, launcher, and motor barrier, has been evaluated and a request for additional funds and time sent to the Contracting Authority.

HEAT HEAD EVALUATION PROGRAM

The pouring funnels with the O-ring were delivered to the J-2 Range and immediately put into use. It was found, however, that the seal obtained by the O-ring was too tight and that a vacuum formed around the booster cavity, thus making it impossible to complete a head in one pour. By filing a small slot into the funnel (see Dwg. No. B-8692, Rev. I, Appendix), the air lock was released, and apparently perfect pours were obtained from twelve out of the twelve heads poured. Some minor experimentation with the preheat and postheat operation is still going on. One hundred sixty heads were poured and approximately sixty machined by the end of the reporting period. The final verdict on the success of pouring heads will not be available until x-rays have been taken.

The first batch of 200 heads will be x-rayed early in October. Some of the heads were poured in two pours. This was due to the fact that, in cases like the one cited above, an incomplete pour was obtained. The top of the Comp. B was scraped off in such a case and a second pour added with no trouble whatsoever. It will be possible, without any doubt, to complete all heads with the two pour system should this prove to be necessary. Since the heads for the final R&D lot were poured in one pour, this is felt to be undesirable. The pouring operation with the modified funnel with the O-ring is very smooth and should produce satisfactory results. At a meeting with Lorne this problem was discussed, and, should there be any further difficulties, Mr. Cox will be consulted. This, however, is not anticipated at the present time.

STATIC TRAIN FUNCTIONING TESTS

The fixtures for this test have given some trouble in the past which was overcome with the set-up as used for the tests conducted during this reporting period. Because of the facility of running 18 shots within a few hours, it was decided to conduct a total of 50 RDX and 50 Tetryl firings using this set-up rather than to attempt to compare results obtained using the present method against results obtained with slightly different fixtures, which varied from the present one as far as the manner of holding the steel plate is concerned. The following is a tabulation of the test:

Train Functioning Test
23 September 1960

Round	Booster	Results	Cross Section of Plate
1	RDX	Plate bent.	Included angle 90° thru hole 3/4"
2	"	" "	" 105° " " 5/8"
3	"	" "	" 75° " " 7/8"
4	"	Plate cracked.	" 135° ----------
5	"	" "	" 135° ----------
6	"	Plate bent.	" 135° " " 9/16"
7	"	Plate bent & cracked.	" 45° " " 1"
8	"	Plate cracked.	" 150° ----------
9	"	BOOSTER DID NOT FIRE.	
10	Tetryl	Plate bent.	" 135° " " 3/8"
11	"	" "	" 105° " " 1/2"
12	"	Plate cracked.	" 105° ----------

Round	Booster	Results	Cross Section of Plate
13	Tetryl	Plate bent.	Included angle 90° thru hole 3/4"
14	"	" "	" 120° " " 5/8"
15	"	" "	" 90° " " 17/32"
16	"	" "	" 135° " " 7/16"
17	"	" "	" 120° " " 1/2"
18	"	" "	" 105° " " 9/16"

The result obtained with RDX appears consistently greater than with Tetryl. This was partly expected. When timing the falling back to the ground of parts of the fixture after each explosion, it was found that approximately 6 seconds elapsed in the case of the RDX and only 3 seconds in the case of the Tetryl shots. The consistency of the Tetryl seems to be better.

Round No. 9 shows that the booster did not initiate. It is interesting to note that a failure of a booster to initiate was the cause of this static testing in the first place and furthermore that the booster in question - in the HEAT head - was Tetryl, while the booster in this case was RDX. In addition to this, as will be seen in the section dealing with the fuze, another low order detonator was discovered when conducting the fuze test. It may then be concluded that this will occasionally happen unless something can be done to make the detonators more consistent. No low order detonators were found in the R&D lot, which contained a high percentage of detonators more than three years old which had originally been made for use in the experimental rifle grenade developed by Hesse-Eastern for Picatinny Arsenal.

USE PETN BOOSTER // DETONATOR SHOULD BE CHANGED

The train functioning tests will have to be completed before any attempt can be made at statistically evaluating the results, but some initial indications have been obtained already. Some delay in obtaining the parts for these tests are being experienced due to the pressure of work in our machine shop.

MOTOR EVALUATION PROGRAM

The study of the strength of components with regard to both motor and barrier thread was completed. Drawing D-8703 in the Appendix shows a 100 times layout of the correct thread form. This drawing is being referenced in both the barrier and the motor details, both of which have been revised in order to tighten up on the thread specifications.

All sixteen motors fired on 30 September operated satisfactorily, and it was quite easy to remove the steel barriers on all of them, including the ones fired at the cold temperature.

Two motors failed during hydrotest, both at 8000 psi. In both cases a lap in the metal was found which caused a hidden crack, resulting in these failures. This fact was immediately brought to the attention of the Harvey Aluminum Company. They will notify us of the results of their examination. They were warned of the importance of keeping consistent good quality in their components. It was pointed out to them that they are playing with people's lives if they are not very careful as to consistent quality. It is felt that this statement is true, since there is a limit to the extent to which our hydrotest precludes failures when actually firing the motor.

FUZE EVALUATION PROGRAM

After carefully revising the drawings to conform to the results of the latest testing of the fuze with the lead ring behind the triggering sleeve, a firing test was conducted in order to determine functioning of the fuze under hot and cold conditions. This is the same test referred to in the System Evaluation section of this report. The same test served to check out the final components and assembly procedures for the whole system. This test was 100% successful as far as the mechanical functioning of the fuze is concerned. One detonator did not initiate as "High Order." The fuzes were all fired in practice heads with fuze cavities. The damage done to the fuze housing is markedly smaller than usual. A portion of the can, containing the explosive elements of the detonator, was still intact. This problem ties in with the lack of train functions discussed in the Head section of this report.

The results of this test have placed us in a position where pilot production of fuzes can commence. Sufficient components are on hand to assemble more than half the order. The remaining components are expected to be delivered during October.

LAUNCHER EVALUATION PROGRAM

The sixteen systems which were fired on 30 September made use of launchers which were either reworked or newly assembled with the new locating fixture. In some cases it was observed that the swivel sleeve had a tendency to bind up. One launcher in particular was very hard to bring into the

erected position. Note was taken of the condition of each launcher before conditioning took place. It was found that only one out of five which were in any way doubtful in this respect gave difficulties in firing. This launcher did fail to allow the actuating lever to pass through the last launcher band. The system was placed back into the conditioning box and fired two hours later for fuze functioning and accuracy. It also has to be noted that this launcher had been previously used. The test, however, showed the necessity of checking certain features when assembling, and it also gave the necessary information as to the proper sequence for assembling the system into the launcher.

The needed bins and shelves have been established and are being made. It is felt that where the tooling is simple and can easily be made in a very few hours using mainly wood, it will be best not to prepare drawings of each tool in order to conserve funds. A series of photographs will be taken during final assembly in order to obtain a good record of any jigs, racks, or other pertinent arrangements which are not covered by formal tool drawings.

PILOT PRODUCTION AND SPECIFICATIONS

When preparing for the test on 30 September, it was found that certain small modifications to the Assembly Procedure will have to be made. The assembly drawings were reviewed, and it was found that a good many of the sub-assemblies will have to be changed in order to show the correct sequence of assembly steps. This work is presently in progress. It may

have to be interrupted temporarily when pilot production starts in order to follow through the actual progress of assembly and testing. However, every effort will be made to wind up with up-to-date specifications and drawings which duplicate as closely as possible the actual assembly process.

Tabulation of Test Results of Test 9/30/60

Items Tested: Final system using practice heads with fuze cavities and with final fuzes loaded with detonators. Re-used launchers as marked on tabulation. Round No. 16 - re-used launcher, HEAT head with RDX booster and fuze assembled 18 months ago under the R&D program.

Test Conditions: Ambient temperature approx. 60°F. No wind. Heavy rain. Target at 50m. Each weapon aimed at center of target using its own sights.

Round No.	Temp.	Assembly Comments	Comments After Conditioning	Hit on Target	Comments
1013	125	Easy operation	Easy operation	Center	OK
1014	-25	Doubtful	" "	"	"
1015	"	Easy operation	" "	"	"
1016	"	" "	" "	"	"
1017	125	Medium	Doubtful	"	"
1018	-25	Very poor	Very poor	"	"**
1019	125	Good	Good	"	"
1020	-25	Medium	Some doubt	"	"
1021	125	Good	Good	"	"
1022	"	"	"	"	"
1023	-25	Very good	Very good	High	"
1024	"	Medium	Good	Low	"

Hesse-Eastern

Round No.	Temp.	Assembly Comments	Comments After Conditioning	Hit on Target	Comments
1025	-25	Medium	Good	Center	OK
1026	"	Good	Good	"	"
1027	"	Good	Good	"	Low order det.
1028	Amb.	Poor		HEAT rd. 6" plus penetratior	

**Note on Rd. No. 1018: This round failed to operate because of difficulties with the swivel sleeve. It was the system which showed up poorest when testing the operation of the swivel sleeve prior to putting it into the conditioning box. It was placed back in the conditioner and left there for 2 hours. Due to the rain during the test, this system was covered with ice when removed after the two hours. It operated properly then as far as fuze, accuracy, etc. is concerned. The swivel sleeve was worked on with needle-nose pliers to make room for the actuating lever.

The high and low round were both cold rounds; they were approximately 24" above and 32" below the centerline of the rest of the group. The vertical spread of the group formed by the other 13 rounds was 10"; horizontal spread was more than 3 feet. This, however, is attributable to the fact that the target had no aiming mark and that each launcher was aimed in separately.

As far as the difficulties with the launcher are concerned, as already stated in the Launcher section of this report, this could be predicted by a simple check when assembling and will thus be avoided in the future.

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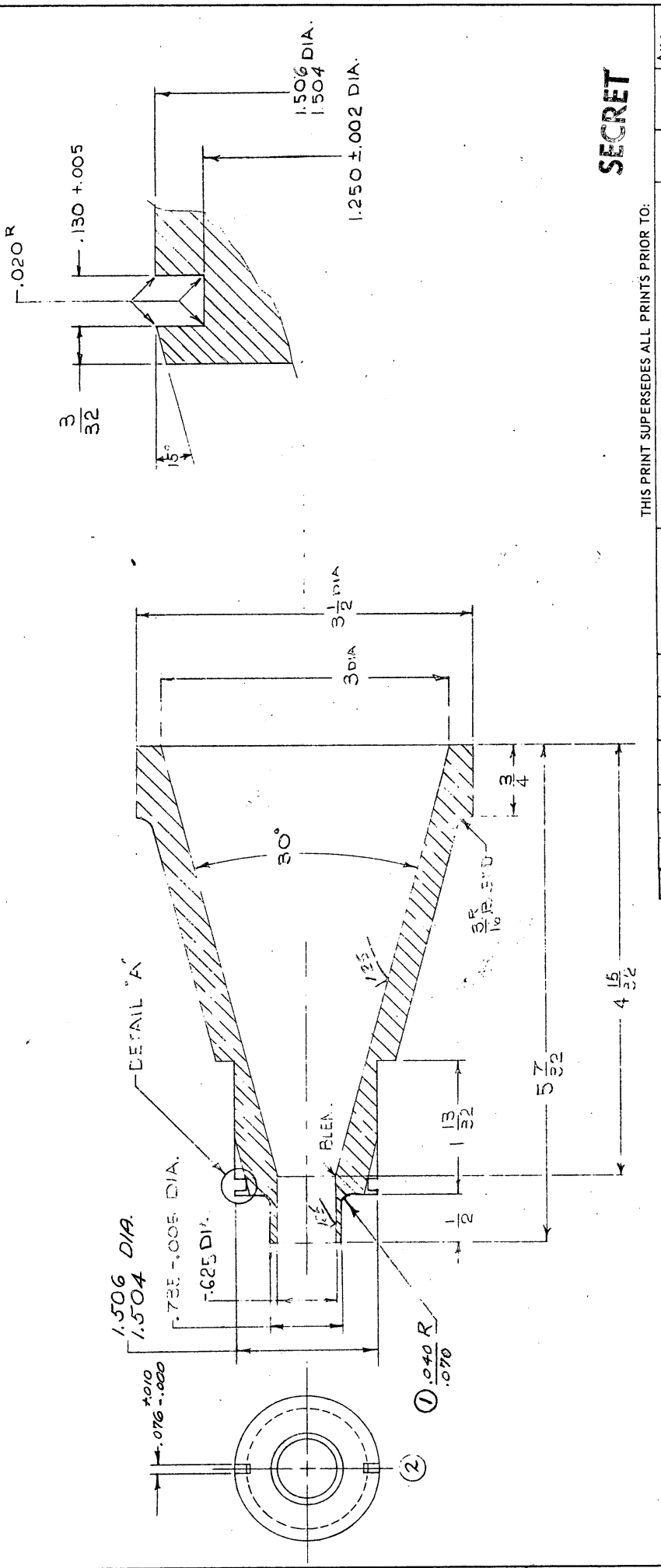

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HESSE—EASTERN, DIVISION OF FLIGHTEX FABRICS, INC.
EVERETT 49, MASS.

POURING FUNNEL

PROJ. [redacted] ASSY DWG
SCALE [redacted] REF DWG B 8691
MAT'L [redacted]

	BY	CH'K'D	ENG'R	APP'D
	HW	[illegible]	[illegible]	[illegible]
	Aug 1 - 1960	8/11/60	8/11/60	8/11/60

B 8692 REV. 2

STANDARD TOLERANCES
DECIMAL ±.005
FRACTIONAL ±1/64
ANGULAR ±1°
ALL DIA. ON SAME ℄ TO BE CONCENTRIC WITHIN T.I.R.
UNLESS OTHERWISE NOTED

BREAK ALL SHARP CORNERS .005—.010

125 FINISH ALL OVER EXCEPT WHERE NOTED

ALL DIMENSIONS APPLY AFTER PLATING

DO NOT SCALE DRAWING

REVISIONS

2	VIEW ADDED	CPF 10-3-60
1	RADIUS 1/8 WAS [illegible]	CPF 9-7-60

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D 8703

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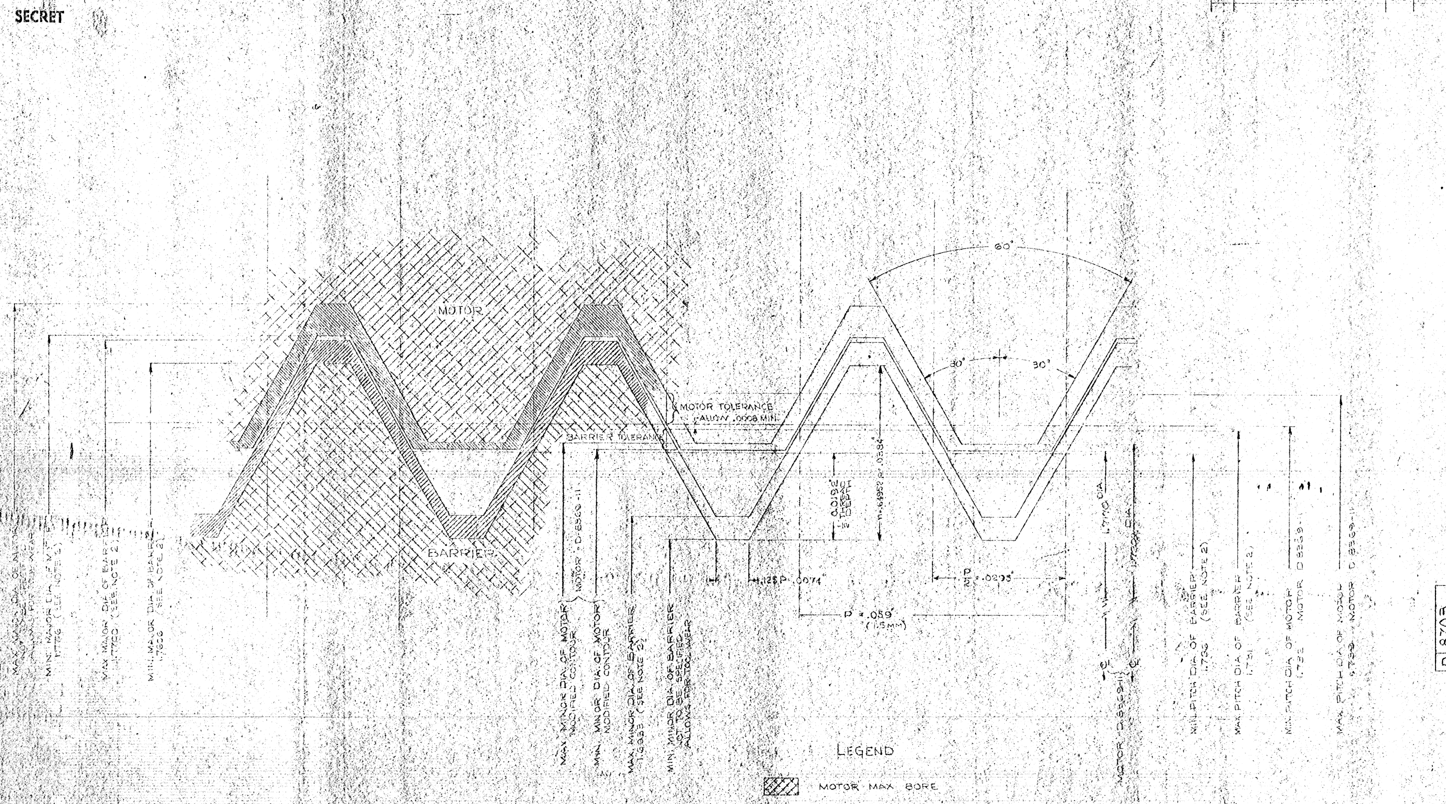

NOTES:

1. ALL TOLERANCES SHOWN ON ONE SIDE
2. CALCULATION METHODS TAKEN FROM "SCREW THREAD STANDARDS FOR FEDERAL SERVICES" 1957, HANDBOOK H-28 PART I PG 30
3. BASIC PITCH DIA = MINIMUM PITCH DIA OF INTERNAL THREAD PG 24 (NOTE 2)

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THIS PRINT SUPERSEDES ALL PRINTS PRIOR TO:

HESSE-EASTERN DIVISION FLIGHTEX FABRICS, INC. EVERETT 49, MASS.	ORIGINAL DATE OF DRAWING: SEPT 14, 1960
COMPARING BARRIER AND MOTOR THREADS 45MM x 1.5 INTERNATIONAL METRIC THREADS SI CL 2	BY: HAW 9-14-60 CHK'D: ENG'R: APPROVED:
SCALE: 20/1	D 8703

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